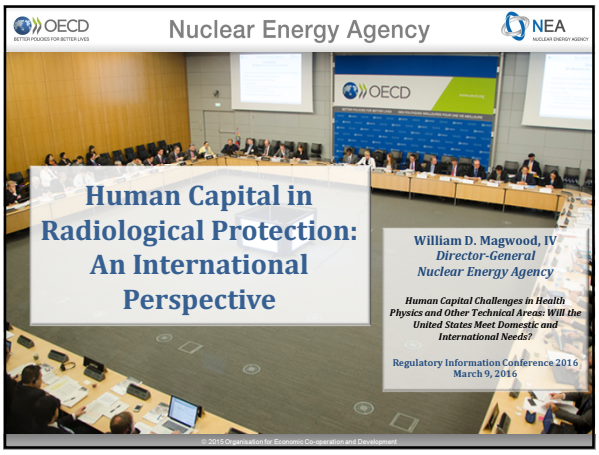
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NEA
Human Capital in Radiological Protection: An International Perspective
William D. Magwood, IV
Director-General
Nuclear Energy Agency
Human Capital Challenges in Health Physics and Other Technical Areas: Will the United States Meet Domestic and International Needs?
Regulatory Information Conference 2016
March 9, 2016
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The NEA: A Forum for Cooperation
• Founded in 1958
• 31 member countries
• 7 standing technical committees
• 75 working parties and expert groups
• 21 international joint projects
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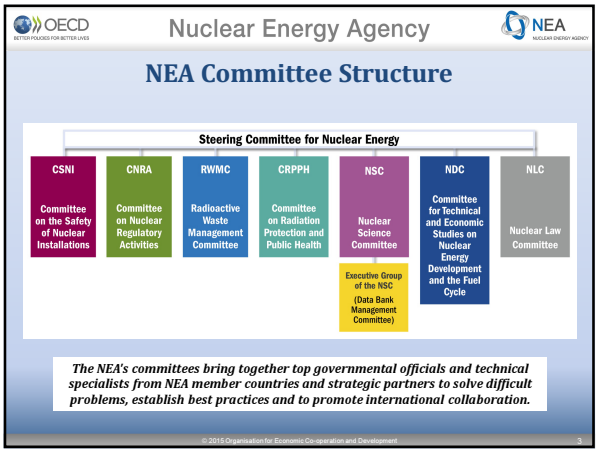
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NEA Committee Structure
Steering Committee for Nuclear Energy
CSNI
Committee on the Safety of Nuclear Installations
CNRA
Committee on Nuclear Regulatory Activities
RWMC
Radioactive Waste Management Committee
CRPPH
Committee on Radiation Protection and Public Health
NSC
Nuclear Science Committee
Executive Group of the NSC (Data Bank Management Committee)
NDC
Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle
NLC
Nuclear Law Committee
The NEA's committees bring together top governmental officials and technical specialists from NEA member countries and strategic partners to solve difficult problems, establish best practices and to promote international collaboration.
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Major NEA Separately Funded Activities

Secretariat-Serviced Organisations

- **Generation IV International Forum (GIF)** with the goal to improve sustainability (including effective fuel utilisation and minimisation of waste), economics, safety and reliability, proliferation resistance and physical protection.
- **Multinational Design Evaluation Programme (MDEP)** initiative by national safety authorities to leverage their resources and knowledge for new reactor design reviews.
- **International Framework for Nuclear Energy Cooperation (IFNEC)** forum for international discussion on wide array of nuclear topics involving both developed and emerging economies.

21 Major Joint Projects
(Involving countries from within and beyond NEA membership)

- **Nuclear safety research** and experimental data (thermal-hydraulics, fuel behaviour, severe accidents).
- **Nuclear safety databases** (fire, common-cause failures).
- **Nuclear science** (thermodynamics of advanced fuels).
- **Radioactive waste management** (thermochemical database).
- **Radiological protection** (occupational exposure).

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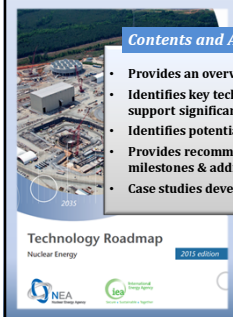
2015 NEA/IEA Technology Roadmap



Contents and Approaches

- **Provides an overview of global nuclear energy today.**
- **Identifies key technological milestones and innovations that can support significant growth in nuclear energy.**
- **Identifies potential barriers to expanded nuclear development.**
- **Provides recommendations to policy-makers on how to reach milestones & address barriers.**
- **Case studies developed with experts to support recommendations.**

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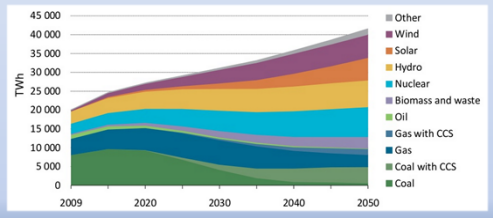
IEA 2°C Scenario:
Nuclear is Required to Provide the Largest Contribution to Global Electricity in 2050



Source: IEA

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Why Do We Need HP/RP Specialists?

- Current nuclear plants will operate well past mid-century
- Countries with nuclear plants today will need to decommission many facilities in coming decades
- Countries without plants desire to understand international radiation risks and maintain emergency preparedness programs
- Operations to store, transport, and dispose of nuclear waste will be ongoing through much of the century
- Medical, industrial, and research use of radiological materials is increasing globally

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So Where Are We?
The Availability of University Programs Offering HP/RP Degrees or Significant Coursework Over the Last 20 years

	Australia	Canada	Czech Republic	France	Finland	Germany	Greece	Ireland	Israel	Italy	Japan
1996	2	1	1	2		1	3		1	4	3
2001	2	1	1	2		1	3		1	4	7
2005	2	1	1	2	3	1	3		1	4	7
2016					3	1		4		3	14

	Korea	Poland	Russia	Slovenia	Spain	Sweden	Switzerland	Turkey	United Kingdom	United States
1996	6	1			2	3	4		1	36
2001	6	2			2	3	3	4	1	28
2005	6	2		2	2	3	2	3	1	23
2016		2	3		3	5	0		6	22

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Survey Results:
Regulatory Organizations in February 2016*

1. **Do you feel that universities in your country produce a sufficient number of graduates in radiological protection to meet your national regulatory needs?**

   1. **General Response:** *No.*

2. **Do you feel that your organization is in a strong position to hire a sufficient number of radiological protection experts over the next 10 years?**

   2. **General Response:** *No. (Strong response from most respondents)*

* 16 Regulatory Organizations and 5 TSOs in 13 NEA Member Countries

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Survey Results:
Regulatory Organizations in February 2016*

3. **In your organization, approximately how many radiological protection experts are currently employed doing mostly radiological protection work?**

3. **Responses:** *Very wide range – 5 to 170.*

4. **How many of these will retire in the next 5 years?**

4. **Responses:** *Range between 13% and 40%, with an average of 20%*

* 16 Regulatory Organizations and 5 TSOs in 13 NEA Member Countries

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Survey Results:
Regulatory Organizations in February 2016*

5. **Of your radiological protection experts, how many would you describe as "highly experienced"?**

5. **Responses:** *Very wide range – 1 to 40.*

6. **How many of these will retire in the next 5 years?**

6. **Responses:** *Range between 0% and 67%*

* 14 Regulatory Organizations and 2 TSOs in 10 NEA Member Countries

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Survey Results:
Regulatory Organizations in February 2016*

7. **How much time is required for each new hire to be trained to conduct required radiation protection duties?**

7. **Responses:** *Very wide range – 6 months to 3 years.*

8. **How much in total, per new hire, do you spend on this training?**

8. **Responses:** *Range 2000€ to 500,000€ - average is 40,000€*

* 14 Regulatory Organizations and 2 TSOs in 10 NEA Member Countries

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Other Notable Results from the Survey

Views Shared by all Respondents*

- New HP/RP hires are not ready for work assignments without training from the hiring organization.
- New HP/RP staff mostly fill "desk jobs" and have few opportunities to learn via hands-on assignments, e.g., plant construction, operation, and decommissioning
- The general view in all countries: there are simply not enough qualified HP/RPs.

* 1 ministry, 16 regulators, 5 TSOs, 2 utilities, 1 university in 13 NEA Member Countries

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Concluding Thoughts

- **Organizations in many countries are struggling to fill needs for radiation protection specialists.**
  - The situation appears likely to get worse in the coming years.
- **Despite the clear need for HP/RPs, the job market is still very limited and is not likely to spur growth in academic programs.**
  - Construction of new plants and increased decommissioning activities could help change this in the future.
  - Retirement experienced staffs could also have an impact.
- **Loss of experience through retirement will be increasing difficult to replace.**

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Thank you for your attention

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